







Adaptive Ground Antenna Arrays for Low Earth Orbiting Satellites

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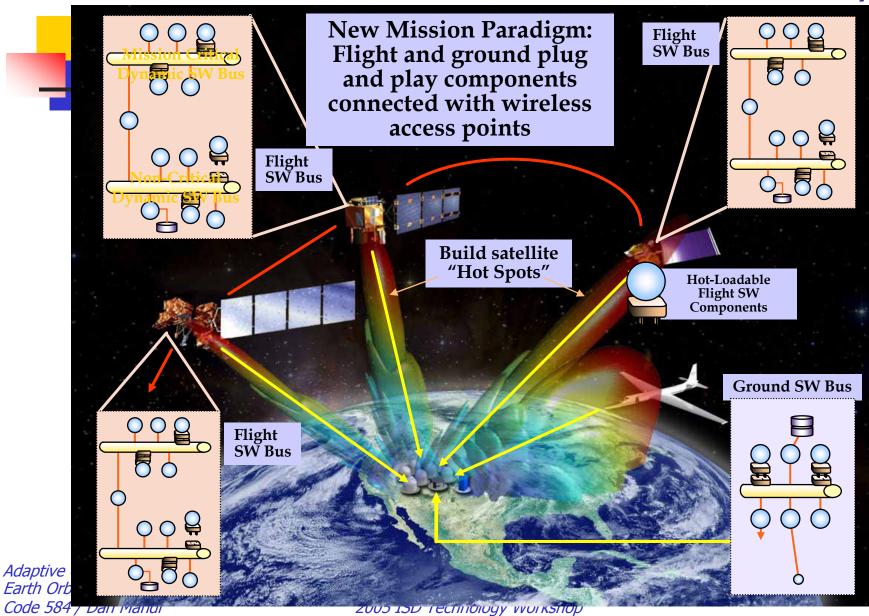




Goals, Objectives, Benefits

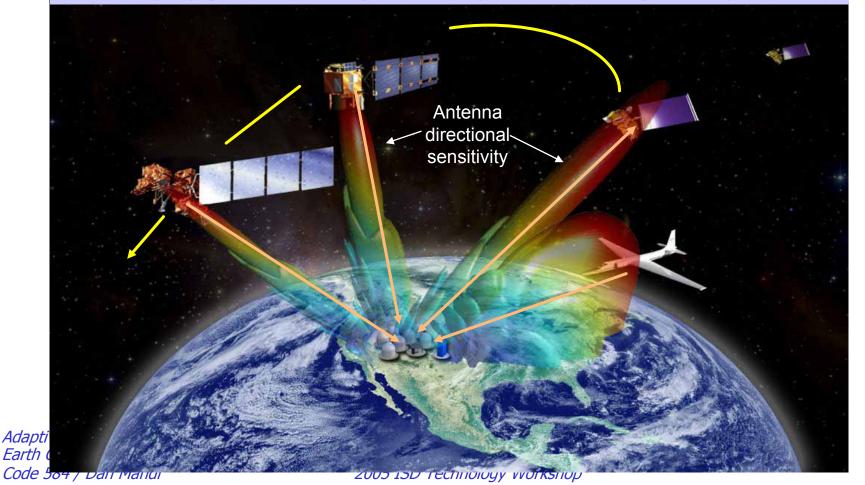
- Enable fabrication of cost effective antenna system for low earth orbiting satellites that act like wireless access points
- Enable sensor webs

Vision to for Future Satellite Connectivity

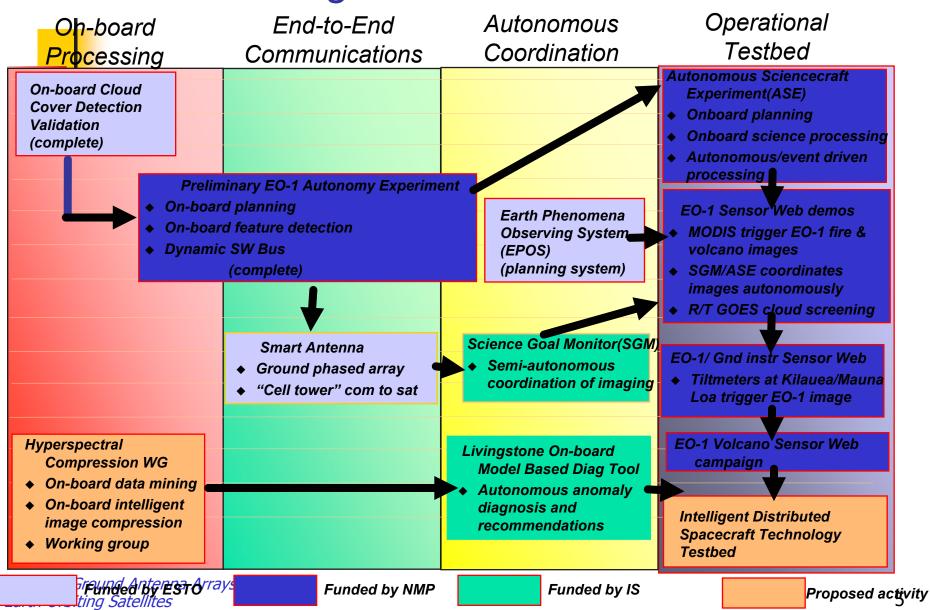


Adaptive Array Antennas Capabilities

- •Antenna patterns adjusted electronically thousands of times per second to follow users and avoid interference
- •Array can be built out of phased array elements or conventional antenna elements
- •Capability for multiple access on a single channel
- •Data rates vary per link according to the configuration of the adaptive array



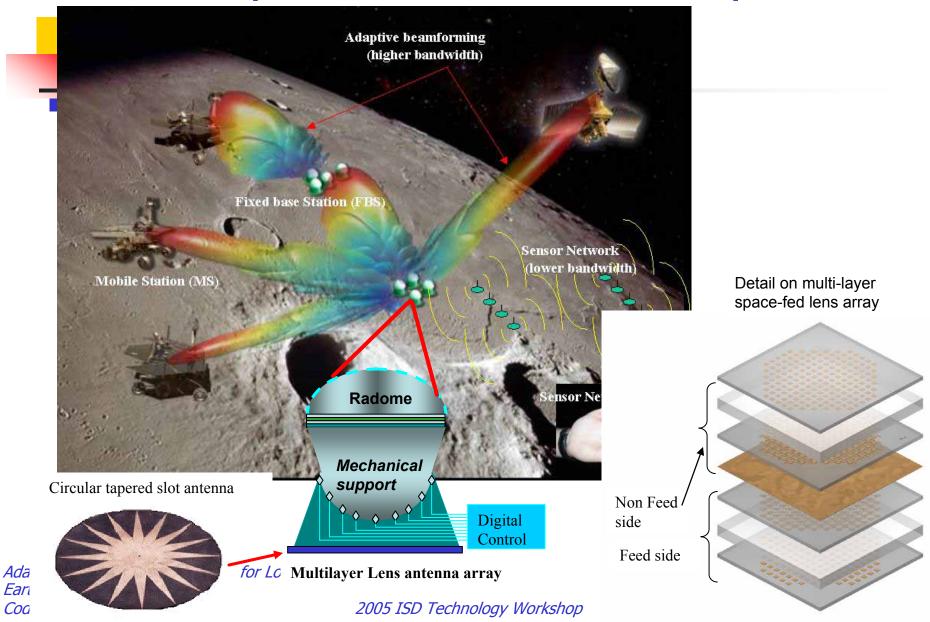
Related SensorWeb Tasks Using EO-1 as a Testbed



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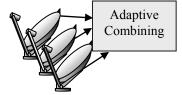
A Proposal for a Lunar Adaptation



Accomplishments and Planned Activities



April 7, 2004 Successfully captured S-band data from EO-1, no steering



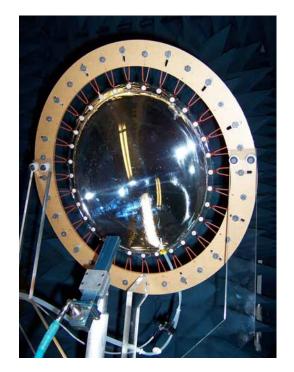
Use 2- 4 mechanically steered small dishes to capture X-Band data from SAC-C (planned March 2004)



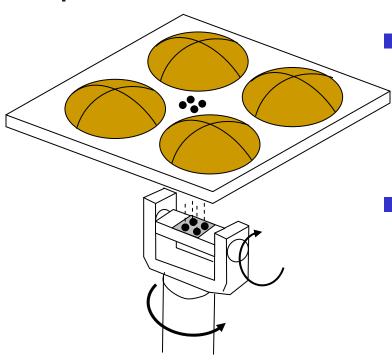
Use 2 – 4 electronically steered antenna elements to capture X-Band data from SAC-C(planned Fall 2005)

SRS Inflatable Apertures to be Used for March 2005 Demo





Mechanical Steering Demo



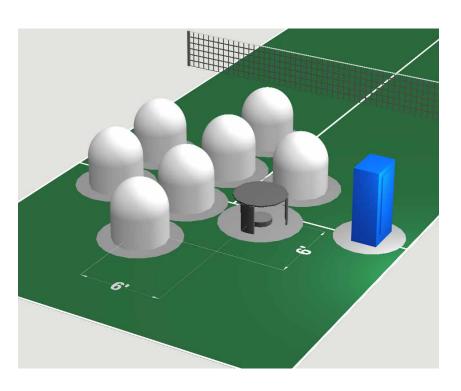
Use SRS's inflatable apertures mounted on positioner

 Will use this system to capture 6 Mbps data from SAC-C in March 2005

GRC positioner

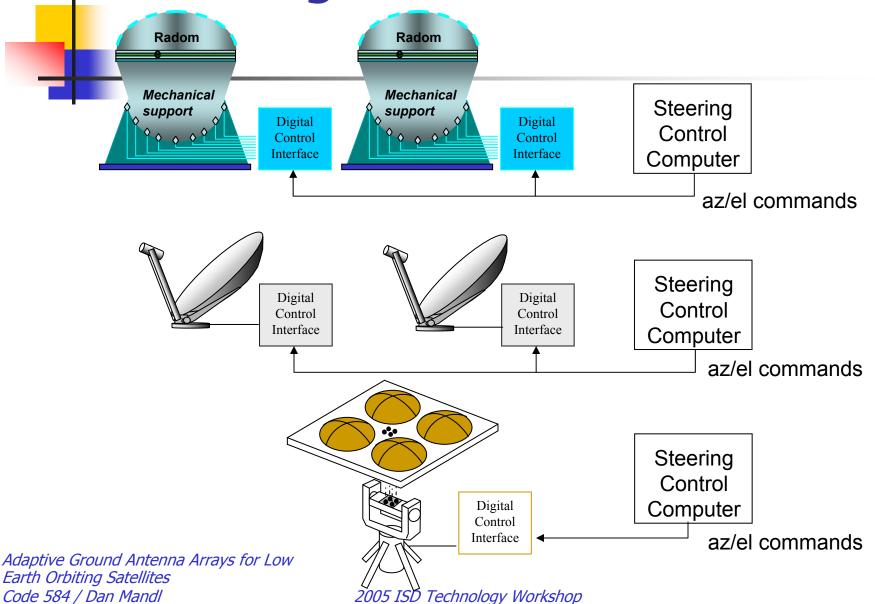
Electronic Steering Demo





- Platform doesn't move
- Az/El control signals command beam directions
- Phased arrays will be calibrated
- Planned demo in Fall 2005 with SAC-C

Steering Control Illustrations



Future Implications

- Presently NASA Ground Network has spent about \$2 4 million for each of the 11 meter antennas it uses
 - Usually resides in harsh climate
 - Mechanical drives decrease reliability
 - Not flexible
- New technology can enable implementation of antenna systems as wireless access points
 - No moving parts
 - Support for multiple satellites
 - Flexible, software control
 - Potential to reduce cost by order of magnitude over presently used
 11 meter dishes
 - Can enable internet type of connectivity thus facilitate new mission operations paradigm